SPECIAL REPORT

(2)

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SPACE TEST RANGE

DECEMBER 1989

RANGE COMMANDERS COUNCIL

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NAVAL AIR TEST CENTER

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MUNITIONS SYSTEMS DIVISION
WESTERN SPACE AND MISSILE CENTER
CONSOLIDATED SPACE TEST CENTER
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AIR FORCE TACTICAL FIGHTER WEAPONS CENTER

December 1989

SPACE TEST RANGE

Dr. James Means

Range Commanders Council
STEWS-SA-R
US Army White Sands Missile Range
White Sands Missile Range, NM 88002

unnumbered
(Special Report)

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This briefing reviews the total Space Test Range concept and reviews the need for the Space Test Range, examines the Test Resource Master Plan, and shows the results of the Multiservice Test Investments Review Committee (MSTIRC)

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PURPOSE (Chart 1)

This briefing reviews the total Space Test Range concept and reminds the Range Commanders that because the Space Test Range is a global concept supported by all three services, they are all involved in it. I was selected to give the briefing because I had initiated the original concept, had the most experience in its evolution, and was currently serving as chairman of the Space Panel of the Multi-service Test Investments Review Committee (MSTIRC). This briefing reviews the need for the Space Test Range, examines the Test Resource Master Plan (TRMP) concepts, investigates the service proposals that were submitted to the Space Panel of the MSTIRC, shows the results of the MSTIRC review, and presents my "bottom line" concerns.

STAR WARS

A "Star Wars" scenario, which was published in Discover magazine, represents a worst case Strategic Defense Initiative (SDI) scenario. It clearly indicates the complexity of a full blown SDI global engagement, something we all hope we will never see. And while it may appear to be overdone, remember that everything shown is within the state of the art and virtually all of the concepts portrayed are actually being pursued. Furthermore, there are already more than 6,000 space objects on orbit, and they must be considered for even the simplest test. An even more frightening concern is that space debris from an in-space "kill" could easily remain in orbit for several hundred years. The debris spreads out over time because of random collisions like a gas cloud.

There are international implications of any test because there are no stationary space objects. All those objects, traveling from 18 to 25 thousand miles per hour, can create enough centrifugal force to offset the pull of gravity from the earth, so all objects have the potential for terrific collisions and could fall anywhere on the globe. In addition, we must maintain accurate tracks on every object and on all the debris, and we must be able to predict the future consequences on all actions taken in this environment. Clearly someone needs to be in charge, and this concept is portrayed by the Space Test Range which would serve as a single point of contact or "lead range" for anyone conducting aggressive tests in space.

SPACE

When the last chief departed from the Joint Chiefs of Staff (JCS), he indicated that "space belongs to the Air Force." He felt we should consider space as an extension of the air, just more rarefied, and hence as the domain of the Air Force. Chart 2 indicates that even the current movies recognize that there is a role in space for everyone. Captain Kirk had to be a Navy officer because he was a Captain in the "Star Fleet." After all, his craft is called "Starship."

There are clearly cases of hand-to-hand combat, so Darth Vader must have been a soldier in an Army. On the other hand, there are superior pilots of "Star Fighters" like Luke Skywalker, who is surely in an Air Force, so everyone has a role in space.

On a more serious note, chart 3 indicates that all three services have been involved in opening up the space frontier. The Navy launched the oldest satellite still on orbit with their Vanguard vehicle. The Army actually launched the first U.S. satellite on an Army booster called Redstone. The Air Force today launches all DOD Expendable Launch Vehicles (ELVs) and has the responsibility at Space Systems Division for launch vehicle and spacecraft design and development. Since all three services clearly require the use of space-borne assets to accomplish their mission today, I would argue that all are and will remain involved in space, and all should be involved in the development of a National Space Test Range.

SPACE-BASED RANGE

The impetus for chart 4 was a Space and Missile Test Organization/CA memorandum I wrote to the Eastern Space and Missile Center/CC and Western Space and Missile Center/CC on 7 October 1982. In this memo, I stated I anticipate that a Space-Based Range, a highly accurate, flexible, near real-time test range, will be required by 1990 to support the space initiatives currently being planned. I asked them to actively pursue a Space-Based Range planning initiative and to create a plan for its development. Western Space and Missile Center aggressively persued this objective and by using their O&M Contractor, Federal Electric Corporation and Stanford Research Institute, International, they developed the Space-Based Range concept depicted in chart 4. Their studies identified the need for internetting existing capabilities, for consolidating launch and orbit support capabilities, for developing a Test and Evaluation Satellite Network (TESNET), and for developing a space-range platform. Maximum use would be made of existing assets, but study money was required to further develop the concepts portrayed in chart 4. As Space Command and the Strategic Defense Initiative (SDI) became real, the interest in this early concept grew. Unfortunately, we were not very successful in getting the much needed study money to further develop the concept. Too bad we weren't successful because the nation quickly entered the realm of aggressive testing in the space environment, and it did that without any planned space test range capability.

SPACE TEST ACTIVITY (Chart 5)

In 1984, the Army conducted the Homing Overlay Experiment (HOE), which was a Ballistic Missile Defense exercise where an interceptor missile was successfully launched from the Kwajalein Atoll against a reentry body deployed from a Minuteman I ICBM launched from Vandenberg Air Force Base. The HOE made a direct hit on the reentry vehicle and ushered the era of aggressive space systems testing, thus validating the need for a Space Test Range. A portion of the debris from this impact generally fell in the direction of the reentry vehicle and caused no concern; however, the portion that fell in the direction of

the interceptor caused some concern. No single agency was fully responsible for the HOE test; consequently, a need for a Space Test Range was confirmed.

In 1985, the Air Force conducted the Anti-Satellite (ASAT) test, launching a miniature homing vehicle from an F-15 launch platform against an inoperative satellite. The F-15 aircraft flew to the Air Force's Western Test Range from Edwards Air Force Base with its ASAT missile attached to the center station. Western Space and Missile Center directed the F-15 to its launch point where it fired the ASAT missile upwards at a point in space. The ASAT missile made a direct hit on the satellite spreading debris in the direction of the target and in the direction of the interceptor; both caused long-term concerns. This test validated the need for a Space Test Range.

In 1986, SDI sponsored a Delta-180 test, which used a missile with a modified AIM-54 (Phoenix) active seeker to "kill" a target launched in common with the shooter. This test was the first with the shooter and the target in space. Likewise, the Delta-181 test conducted another and different in space test; thus, both tests further validated the need for the Space Test Range.

These tests were only the beginning of the need for the Space Test Range. None of these four tests had a Space Test Range to assist them, and as a result, each was done differently. Even more alarming was the fact that none of the expertise from any of these tests was available to support other tests. The Space and Missile Test Organization had General Electric Corporation review the Delta-180/181 tests to document the findings in a "Lessons Learned" paper. This paper strongly supports the development of the National Space Test Range.

STRATEGIC DEFENSE INITIATIVE

An artist concept that appeared in the Harris Bellringer publication depicted a much more simplistic version of the "Star Wars" picture described earlier. It demonstrated the global nature of space testing and tried to show some of the connectivity required to perform these global tests. Besides the need to connect the participants in a test through satellite relays, there is also a clear-cut need to interconnect at the national ranges supporting such a test. This interconnectivity problem is one of the first tasks that the Space Test Range must undertake to support these SDI scenarios.

Imagine, if you will, using a high energy laser at White Sands Missile Range to reflect its directed energy beam off a relay mirror in space to a "fighting mirror," also in space, to "kill" a ballistic missile launched from Vandenberg Air Force Base. We simply must have good connectivity if we are ever to support space tests of an SDI system.

SDI END-TO-END TEST

Probably the most simplistic SDI test scenario is the one in chart 6. It depicts the near simultaneous launch of two boosters from Vandenberg Air Force Base. One booster could be a Fleet Ballistic

Missile (FBM) or both boosters could be Intercontinental Ballistic Missiles (ICBM), such as the Minuteman III. One of the boosters is a dumb booster which can be detected in the launch phase by the SDI. That booster would be targeted and killed, providing that SDI could have targeted and killed an all-up-round with the reentry bodies (RBs) still on the booster.

The second booster is an all-up-round detected by SDI. For this scenario, however, it is not killed. In fact, it is permitted to deploy the bus and all three RBs. After the RBs are released, the bus is targeted and killed, proving that the SDI system could have killed the bus while the RBs were still attached. The first RB can then be targeted and killed by an SDI interceptor leaving two RBs to exercise the Army's terminal defense portion of SDI. The third RB can be targeted and killed by an exoatmospheric interceptor, and the second RB can be targeted and killed by an endoatmospheric interceptor.

This simplistic end-to-end test is not trivial when you consider that many of the SDI in-space participants are circling the earth every 90 minutes. A video simulation of this scenario was produced showing the complexity of the Space Test Range's efforts in supporting even the most simplistic SDI scenario.

SDS MISSION AVERAGE

The end-to-end test presented, at most, six targets to an SDI test:

Boosters	- 2
Bus	- 1
RVs	- 3

A system like SDI proposed would surely require a much more stressing test than the SDI end-to-end test, previously described, before the system could be certified as operationally ready.

Chart 7 is an OT&E view of the target requirements for an SDI representative test. For example, to exercise the system with a mass attack of ICBMs or FBMs or both would require the near simultaneous launch of 52 surrogate missiles. To even test the SDI against liquid fuel boosters requires the near simultaneous launch of seven liquid propellant surrogate missiles. Our national capability today might be able to present a few simultaneous targets but could not come even close to the numbers identified on this chart.

SPACE TEST RANGE ACTIVITIES (Charts 8, 9, 10)

Currently the tri-services have identified the need for a Space Test Range. The Army's program, called the Army Space Systems Test Bed (ASSTB), identifies the need for testing space-borne capabilities and for exploiting space assets to support terrestrial testing. The ASSTB effort has been a big driver in the interconnectivity.

The Navy extended its Mobile Sea Range concept to be able to exercise the fleet anywhere in the world. The World Range effort identified a standard range unit (control center), a relay unit, and a participant unit (operational unit) on the vehicle under test. The interconnectivity problem is aggravated in the sense that they cannot use lead lines for interconnectivity because they are pretty much satellite dependent.

The Air Force has been working the Space Test Range concept since 1982. The current concept is to start simple work with interconnectivity of existing assets and "grow" additional dictated capabilities as needed. This concept is clearly a global range and in the beginning used the Satellite Control Network of Space Command for some of its interconnectivity. Also used are the existing Satellite Control Facilities in the initial concept as a control center.

MSTIRC INPUTS (Chart 11)

The Army's input to the MSTIRC was called Space Solution Plan. It provides the capability to test future military space systems and to develop the Army Space Systems Test Bed.

The Navy's input to the MSTIRC was called World Range/Integration. It provides large, deployable instrumented test areas linked by satellites to fixed range control centers.

The Air Force's input to the MSTIRC was called Space Test Range. It develops and acquires a space test range, operates and maintains existing test range capabilities, and establishes a Joint Program Office (JPO) to manage the DOD Space Test Capability (DSTC).

ARMY SPACE SYSTEMS TEST BED

The Army Space Systems Test Bed concept is depicted in chart 12. A battlefield commander will use space assets to view a tactical battlefield object area beyond the forward line of his own troops (FLOT). Electro-optical or infra-red (ED/IR) data would be used to image the field of view for use by the tactical commander in engaging the opponent in the objective area.

If a tactical commander is expected to use these space assets to aid his war fighting capabilities, then he needs a way to test and to train using its capabilities. The ASSTB proposes a way to test and evaluate space systems and to permit training engagements of forces separated by significant distances. Nothing depicted here is beyond the state of the art, yet there is currently no system in place to support this type of testing. The ASSTB requests funding to develop this kind of a capability. The space solution plan is ASSTB expanded to include the capabilities to test and evaluate the actual satellite assets themselves.

WORLD RANGE ARCHITECTURE (Chart 13)

The Mobile Sea Range (MSR) concept permits the Navy to conduct fleet exercises anywhere in the world by using a dedicated instrumentation ship within the fleet to control the test, to present the targets, and to evaluate the results. The MSR, as we know it today, is not useful for fleet-on-fleet engagements. The World Range concept solves this problem by using space relays to connect the separate fleet activities. The fleet commanders, like in ASSTB, also need to use space sensors to see into the opposing fleet to conduct a realistic battle.

The Navy has postulated a standard range unit (SRU) that can be used as a control center for a world range operation. Likewise, an operations unit (OU) is a package carried on each participant in the operation to make its time-space-position information (TSPI) available to the SRU. Since these participants are frequently outside the line of sight to an SRU, the Navy proposes the use of a relay unit (RU) to provide the connectivity.

World Range (WR) permits support to the fleet commanders using a few real threats and numerous simulated threats. Furthermore, if World Range can support extensive fleet exercises, it can also be made to support conventional test and evaluation over the horizon. Though it has not been stated, the World Range may need to be expanded to include the capabilities required to test and evaluate the actual satellites themselves. The Navy requests funding to develop the World Range concept into an operational system.

SPACE TEST RANGE

Chart 14 depicts an initial Space Test Range (STR) capability, and identifies an STR Support Center at Onizuka Air Force Base, Sunnyvale, California. The Support Center provides normal mission support such as telemetry, communications, safety, payload operations, scheduling, and commanding anywhere in the world. Connectivity is provided by means of terrestrial and space relay. Shown are relays using an existing COMM satellite and a data relay satellite like NASA's TDRSS.

An existing "Sensor Bird" is used to observe the test article in flight. Hence, the STR in the near term is a global internetting of existing capabilities to support test and evaluation. It is also a single focal point for any test and evaluation or experiments conducted in space. The Consolidated Space Test Center (CSTC) includes the Space Test Range (STR) as a normal mission element and operates just like any other Major Range and Test Facility Base (MRTFB) entity, but on a global basis and without the luxury of dedicated assets. The STR can support test and training requirements of weapons systems, and it already includes the test and evaluation of satellites themselves. It necessarily requires close coordination with the Space Command, NASA, and the MRTFB ranges.

The Air Force is requesting money to implement the initial STR capability. Later, the STR will evolve into the Space-Based Range shown earlier as dedicated DOD test satellites eventually take over from existing ground-based assets. While the STR is frequently viewed as an Air Force project, it leads to a DOD Space Test Capability (DSTC) managed by JPO and is fully capable of supporting STR, ASSTB and WR concepts. So how much does it all cost?

FUNDING (ALL SOURCES)

The data on the first three lines of chart 15 comes directly off the Test Investment Proposal sheets the services submitted to the MSTIRC in accordance with the TRMP process. Note that STR is ready to go, and they have a dedicated organization and contractor support in place. According to the chart, the Army really begins ASSTB in FY94 and expects to have a concerted effort in FY95-96. The World Range (WR) launches in FY95 and maintains a reasonably large effort for a long time thereafter. These numbers were developed independently, so there may even be triple counting with everyone solving the interconnectivity problem.

The last line on the chart represents the Central Test and Evaluation Investment Program (CTEIP). The CTEIP line grew out of DOD-sponsored Strategic Systems Test Support Study number 3 (Space Systems) and a following Space Systems Test Capability Study. These two efforts identified the need for major test investments to support Space Systems Testing. Mr. John Krings (DOT&E) was successful in getting this line created to fund some of the shortfalls. This process is documented in the TRMP to some extent.

There was an additional $3 million of SDIO funding given to the Air Force in FY89 to conduct a Space Test Range Architecture Study. Another $3 million of SDIO funding was used in FY90 to initiate activation of the STR, and the CTEIP provided an additional $3 million in FY90. The funds in FY91-94 are insufficient even to support the Air Force's STR effort alone, much less the WR and ASSTB efforts. Nonetheless, the Air Force plans to use the Army to conduct the internetting task and the Navy to work a space range scheduling task to keep everyone working together.

One thing is clear, we will not build three separate ranges. Only the DSTC will be built, and it must support all three services. It is imperative that a JPO be created immediately to manage CTEIP and other funds to accomplish the DSTC. Incidentally, there might have been more money to the CTEIP except that the Air Force and Navy reduced their participation in the SSTSS number 3 effort and the Army had to carry most of the support to the study.

MSTIRC RESULTS (Chart 16)

The Space Panel of the Multi-service Test Investments Review Committee has to validate each of the service proposals. They have a fairly extensive score card to complete, grading each proposal on commonality, interoperability, feasibility, cost effectiveness, and siting.

There were 49 proposals submitted to the Space Panel; ASSTB, WR, and STR were three of them. The bottom line was the Space Panel supported all three of them. They issued an "A" rating to the STR and WR and a "B" rating to the ASSTB. Although both of these ratings recommend funding the proposal, there were concerns expressed during the evaluation that they need to be integrated to avoid duplication of effort. So everyone thinks the proposals need to be done, but they need to be done together and in a very cost-effective way. Let me show some of the complexities involved.

DESIGN REFERENCE MISSION SAFETY ASPECTS

Chart 17 is really part of the STR. The Air Force Space Test Range Architecture Study was conducted for the Air Force by Aerospace Corporation. There was a tri-service General Officer Steering Committee (GOSC) that guided the Aerospace Corporation's effort under the purview of then Maj Gen Donald L. Cromer, USAF.

Aerospace Corporation was asked to use Design Reference Missions (DRM) in the study to depict classes of systems that would be tested on STR. Under direct cost reimbursable funding, a DRM would permit users to support the concept without the risk of having to fund it if they needed it. Prepared by the ASSTB community, this is actually an Army DRM which clearly shows the complexity of an Army C^3I constellation mission. The various agencies are identified above the horizontal line and connectivity is shown below the line. Launch and de-orbit operations will each be required at least once, while on-orbit operations may require the use of other existing space-borne assets.

Interconnectivity must be maintained between all active participants at all times. This chart depicts an easy test compared to an agressive test of a shooter, interceptor, and target. Consider then a full-blown SDI scenario as discussed earlier. And don't forget, most of these participants are moving at terrific velocities and may be as much as 22,000 miles above the earth. Any have the potential to interfere with or to damage something else. Perhaps that "something" is from another nation. Now look at just the connectivity for this "easy" DRM.

INTER-RANGE COMMUNICATIONS FOR ASSTB

Chart 18 is an Army chart from ASSTB. It attempts to portray the separate interconnectivity that must be provided between the activities and participants in the DRM just discussed. Note that only four Army Ranges are shown on the chart: Electronic Proving Ground (EPG), Yuma Proving Ground (YPG), Dugway Proving Ground (DPG), and White Sands Missile Range (WSMR). Also included are two Air Force Ranges: Eastern Test Range (ETR) and Western Test Range (WTR) because any satellite will be launched from one or the other of these ranges. The chart also includes CSTC as the Space Test Range control center; however, support could be required from any of the MRTFB ranges to ensure global support. And again, this is a non-aggressive satellite. Consider the complexity of the SDI scenarios shown earlier.

The Army has Georgia Tech Research Institute (GTRI) under contract and the Air Force plans to use the Army and, in turn, GTRI to accomplish the terrestrial networking problem with some of the CTEIP funding. Maximum use will be made of fiber optics for interconnectivity because the time delays are significantly less than using satellites. Again, good cooperation is seen between the services in working towards the common goal - a DOD Space Test Capability (DSTC). So what is the bottom line?

BOTTOM LINE (Chart 19)

First, I hope I have shown that space testing is a reality. We are in the business today. The HOE, ASAT, and Delta-180 tests have already happened. Such tests will continue to happen with increased frequency and complexity. Consequently, the risks are greater than anything we have ever done before, and we simply cannot afford to do this job poorly.

Second, at best, the nation can only afford one DOD Space Test Capability (DSTC). There is no way that ASSTB, WR, and STR can hope to exist independently; only the DSTC can survive.

Third, we can only ensure that all three services needs are met if we have all three involved all the time. The Joint Program Office must be created before any funds are spent on an STR, WR, or ASSTB that could have been saved by an integrated approach. This approach must be DOD directed because service participants cannot cross service lines without DOD direction.

Fourth, internetting is the key to getting a DSTC operational now. It takes hundreds of millions of dollars to field a satellite, and the services will eventually need some dedicated ones. But for now, we can become operational by internetting existing assets and developing a common control center. Internetting is the key to exploiting existing assets and needs to be implemented now. The GTRI seems willing to step up to it and with CTEIP funding we can make that happen.

Fifth, we need to start the effort now. In 1982, ESMC and WSMC were directed to begin posturing for a Space Test Range. Some small incremental advances in that direction have been made, but the nation is little more capable of supporting space test and evaluation today than it was then. We need the JPO and the funding now - we are already late. Must we wait until debris prohibits operations or until we have an international incident to get serious? How long will we bicker about hard requirements before we get serious about doing something we all know needs to be done? Please gentlemen, let's get started now, collectively, for the good of us all!

NATIONAL TEST CAPABILITY BASE (Chart 20)

This last Navy chart can be viewed as a Werm Diagram identifying the fact that ASSTB, WR, and STR are all part of the DOD Space Test Capability (DSTC). There are areas of overlap and areas unique to each. The big payoff comes in building one range, the DSTC, that supports the needs of all three services instead of three separate ranges.

Let's all work together smarter, not harder. We have a much better chance together than separately. We need your support; for each of you is a player and each of you can help influence your service and through them, the DOD. And we stand to gain in aeronautical and surface testing through the support derived from this interconnected capability.

PURPOSE

- REVIEW NEED
- REVIEW TRMP INVOLVEMENT
- REVIEW RELATED SERVICE PROPOSALS
- REVEAL MSTIRC RESULTS
- BOTTOM LINE

AIR FORCE SYSTEMS COMMAND

SPACE BELONGS TO:

NAVY: CAPT KIRK WAS
STAR FLEET COMMANDER

ARMY: DARTH VADER WAS
A SOLDIER

AIR FORCE: LUKE SKYWALKER
WAS AN AIRMAN

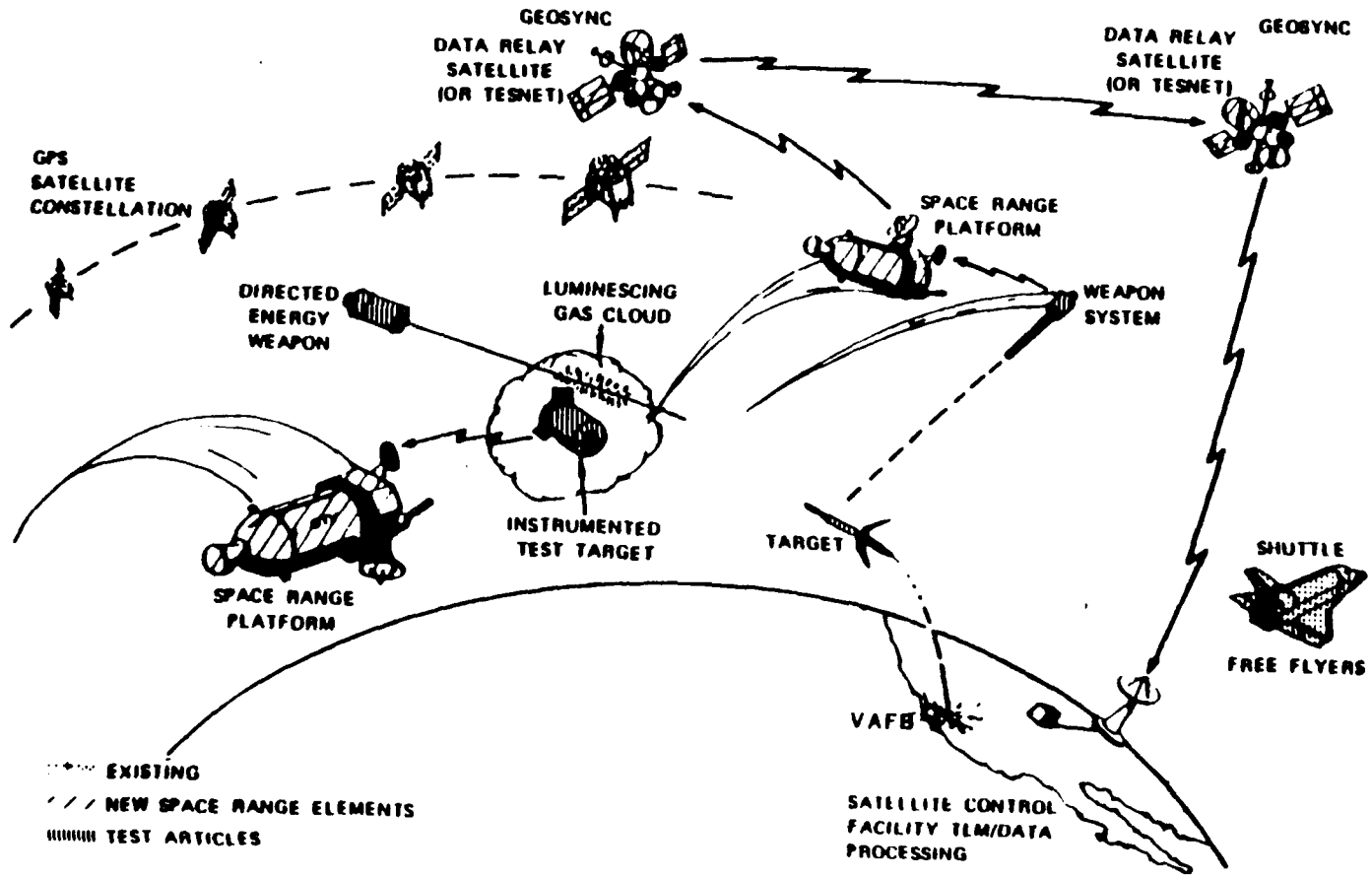
SPACE BELONGS TO:

NAVY: OLDEST SATELLITE IS VANGUARD

ARMY: FIRST US SATELLITE BOOSTER (REDSTONE)

AIR FORCE: ALL DOD ELVs ARE AIR FORCE

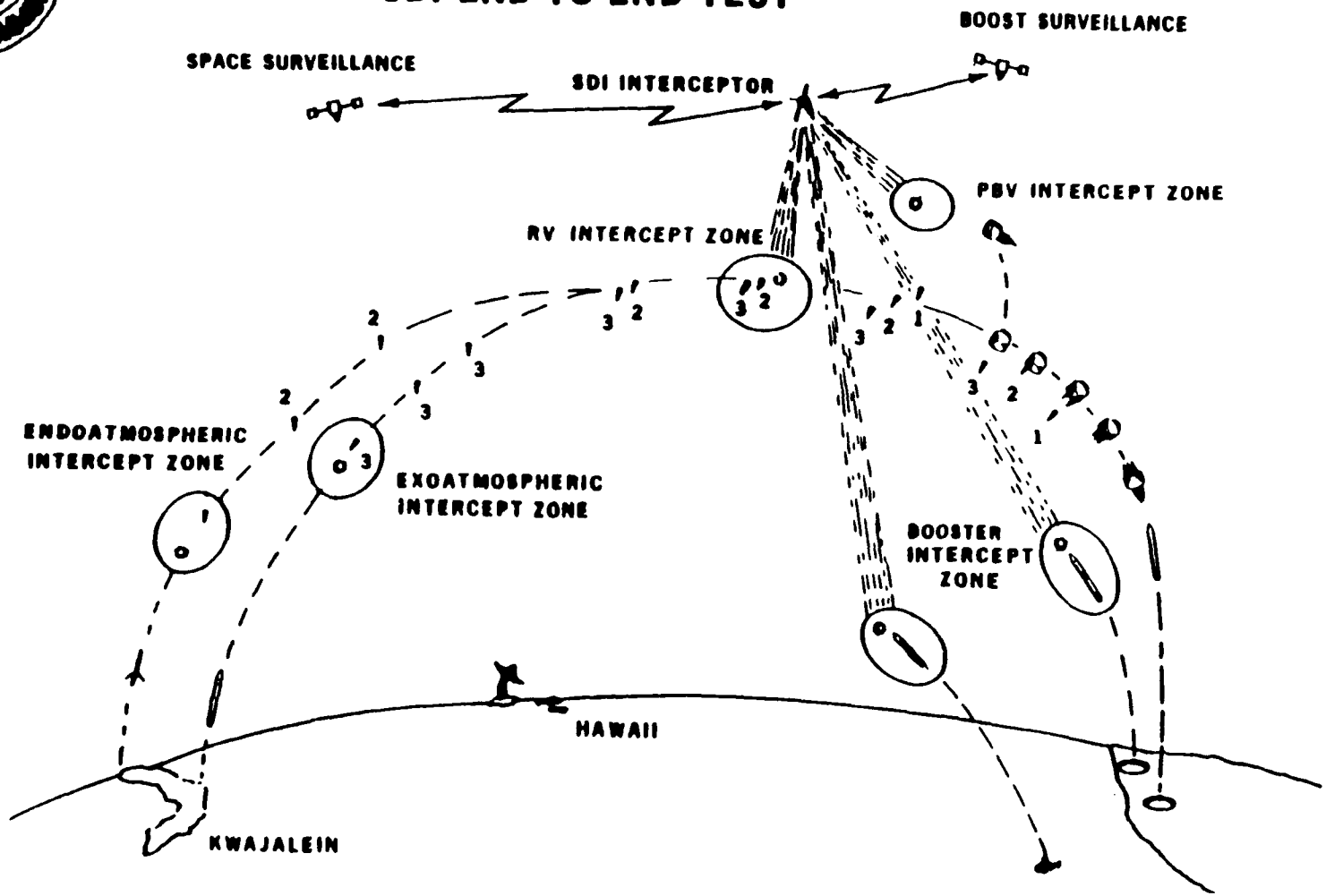
SPACE BASED RANGE



SPACE TEST ACTIVITY

HOE	ARMY	1984
ASAT	AF	1985
DELTA 180	SDI	1986
DELTA 181	SDI	1987

SDI END-TO-END TEST



SDS Mission Coverage

Scenarios \ Targets	3 Titan IIs	7 Liquid Propellant Surrogate Missiles	1 SLBM	1 SLBM + 1 MM-III	52 Solid Salvo Surrogate Missile
Mass ICBMs/SLBMs					X
Few ICBMs/SLBMs		X		X	
Single ICBM/SLBM	X		X		
Remote location launch			X		
Fast burn booster					X
Slow burn booster					X
Penaids			X	X	
Single RV			X	X	
Multiple RVs			X	X	
Solid Fuel Booster			X	X	X
Liquid fuel booster	X	X			

3.1 DoD SPACE TEST CAPABILITY

REQUIREMENT: NEAR, MID, FAR TERM

LEAD: Air Force

SHORTFALL: The ability to efficiently conduct long-term, high-fidelity testing of DoD systems in space does not exist. The national defense is becoming even more dependent on space assets. A single agency responsible for integrated and coordinated command, control, communication, tracking, telemetry, scoring, independent safety assessment and data processing capabilities is needed to routinely and safely conduct on-orbit space systems tests & experiments. The nation has extensive capabilities on land, water and air, but has no similar capability in space. The potential exists for a serious accident or mishap as a result of space test operations in an environment shared by all nations.

INITIATIVE: Develop an execution plan by January 1990 that clearly sets policy and describes the national approach to developing, operating and maintaining a DoD space test capability. This plan will also specify an organization geared to satisfy joint requirements.

FUNCTIONAL AREA: 3. SPACE SYSTEM TEST CAPABILITIES

The Space System Test functional area is judged the most serious long term deficiency. DoD is heavily dependent on space systems today. That dependence is expected to increase in the future. The safe conduct of space experiments and tests clearly warrants the establishment of space test functional responsibility and the planning for its timely upgrade to ensure adequate future T&E support for space system acquisitions and experiments. The interdependence between all future weapons and space assets dictates the need for this function to interface with many of the more traditional range functions and system acquisitions.

SPACE TEST RANGE ACTIVITIES

ARMY SPACE SYSTEMS TEST BED

NAVY WORLD RANGE

AIR FORCE SPACE TEST RANGE

MSTIRC INPUTS

ARMY – SPACE SOLUTION PLAN

+ PROVIDES THE CAPABILITY TO TEST FUTURE MILITARY SPACE SYSTEMS.
+ DEVELOPS THE ARMY SPACE SYSTEMS TEST BED.

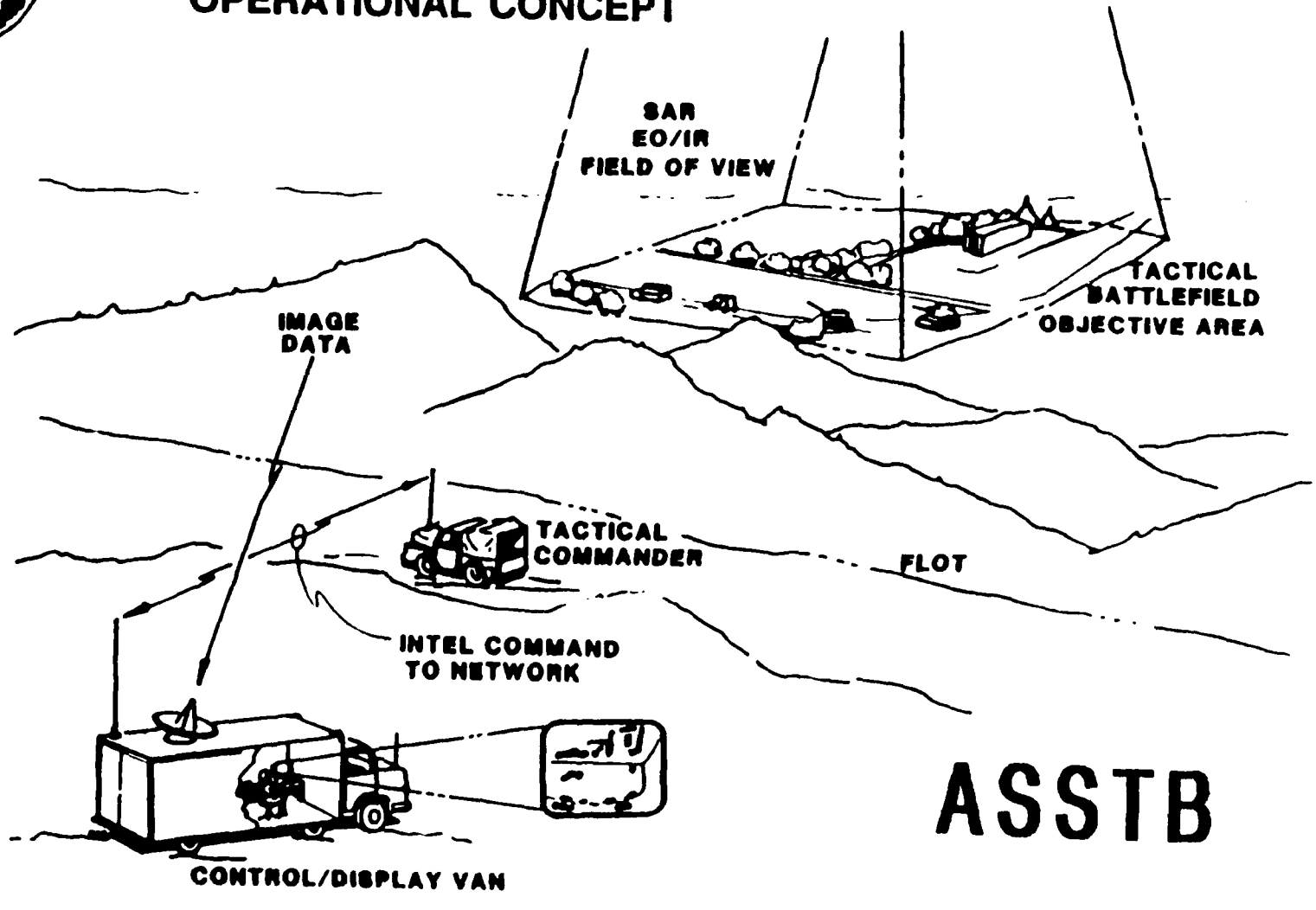
NAVY – WORLD RANGE / INTEGRATION

+ PROVIDES LARGE, DEPLOYABLE INSTRUMENTED TEST AREAS.
+ LARGE TEST AREAS ARE LINKED BY SATELLITES TO FIXED RANGE CONTROL CENTER(S).

AIR FORCE – SPACE TEST RANGE

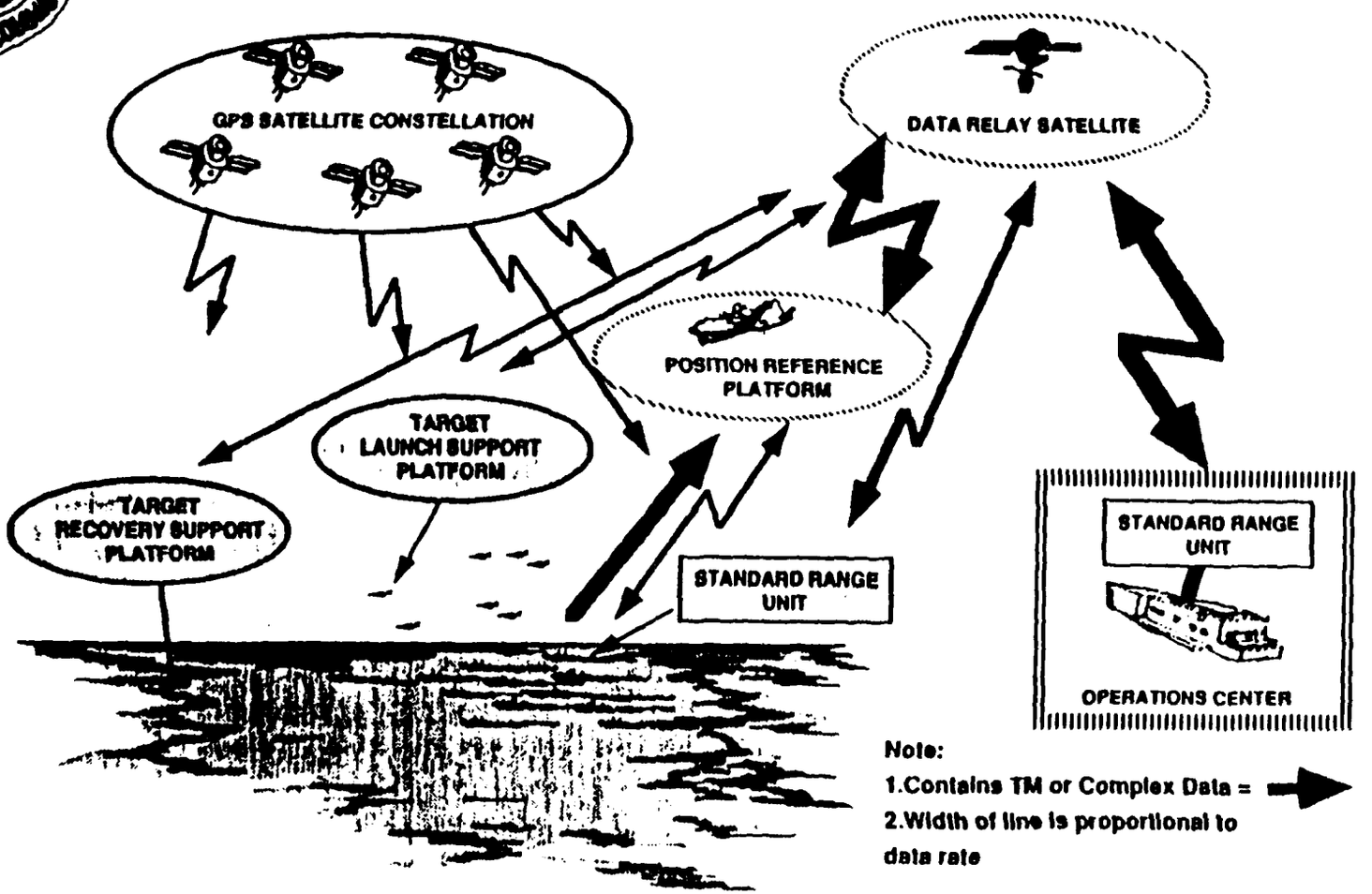
+ DEVELOPS AND ACQUIRES SPACE TEST RANGE.
+ OPERATES AND MAINTAINS EXISTING SPACE TEST RANGE CAPABILITIES.
+ ESTABLISHES A JOINT PROGRAM OFFICE TO MANAGE DOD SPACE TEST CAPABILITY

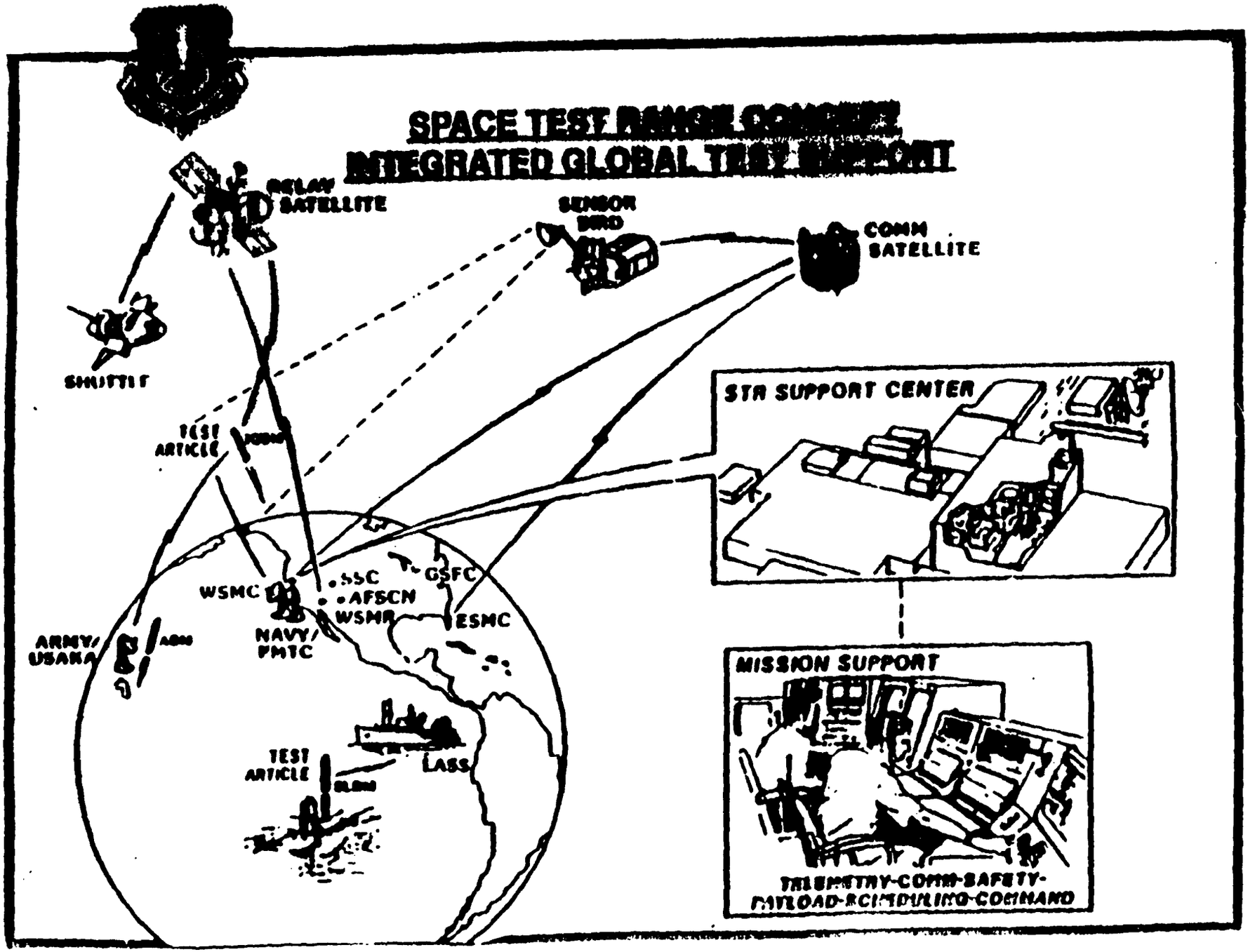
DESIGN REFERENCE MISSION (DRM) OPERATIONAL CONCEPT



ASSTB

WORLD RANGE ARCHITECTURE




RELAY SATELLITE
SENSOR SBIRD
COMM SATELLITE
SHUTTLE
TEST ARTICLE
STR SUPPORT CENTER
WSMC
SSC
AFSCN
WSMR
GSFC
ESMC
NAVY/ PMTC
ARMY/ USAKA
TEST ARTICLE
LASS
MISSION SUPPORT
TELEMETRY-COMM-SAFETY-
PAYLOAD-SCHEDULING-COMMAND

FUNDING (ALL SOURCES)

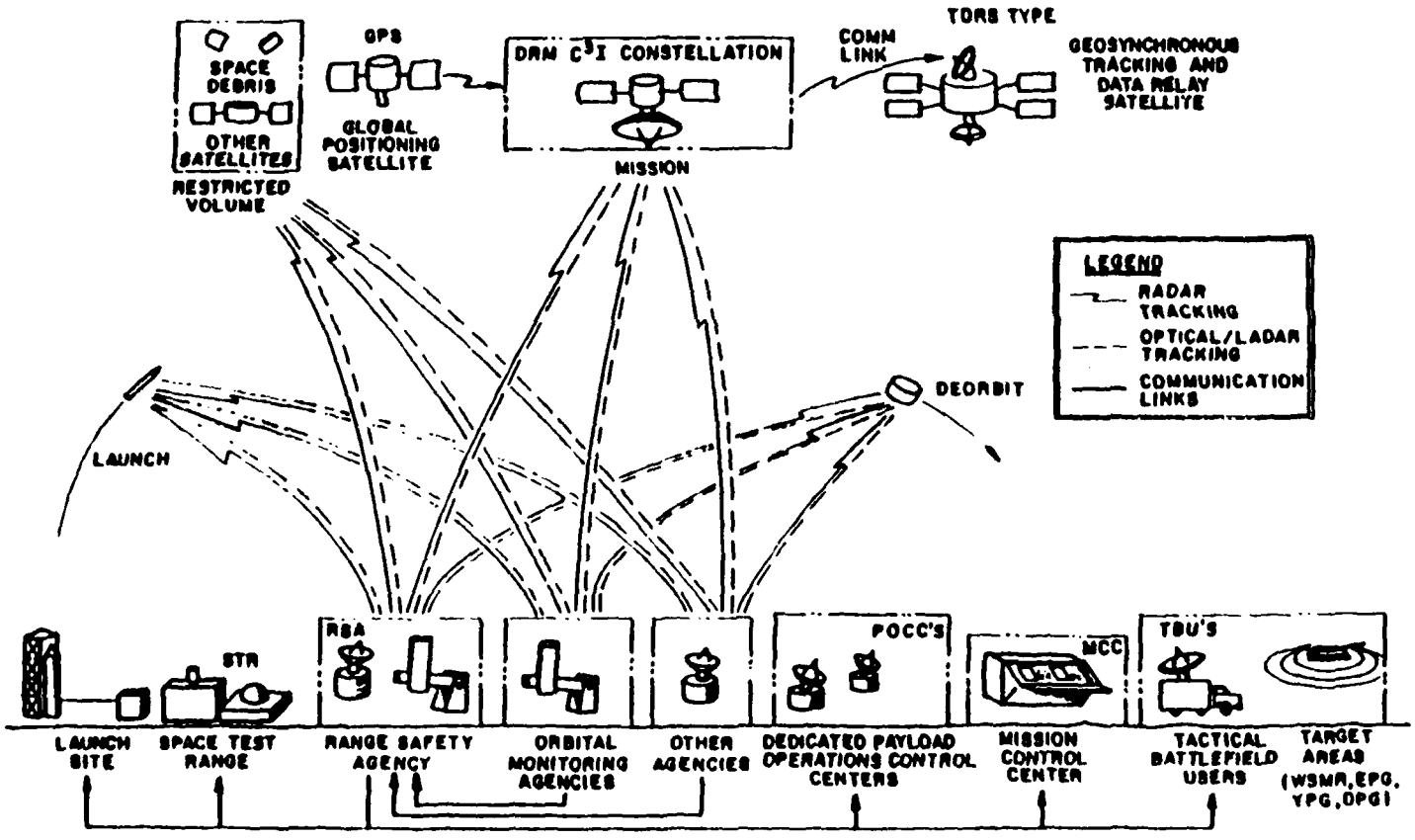
FY	91	92	93	94	95	96	97	98	99	00
ASSTB				0.4	132	115				
WR					16	5	6	14	4	6
STR	20	41	77	85	94	106	117			
CTEIP	15	32	66	77						

MSTIRC RESULTS

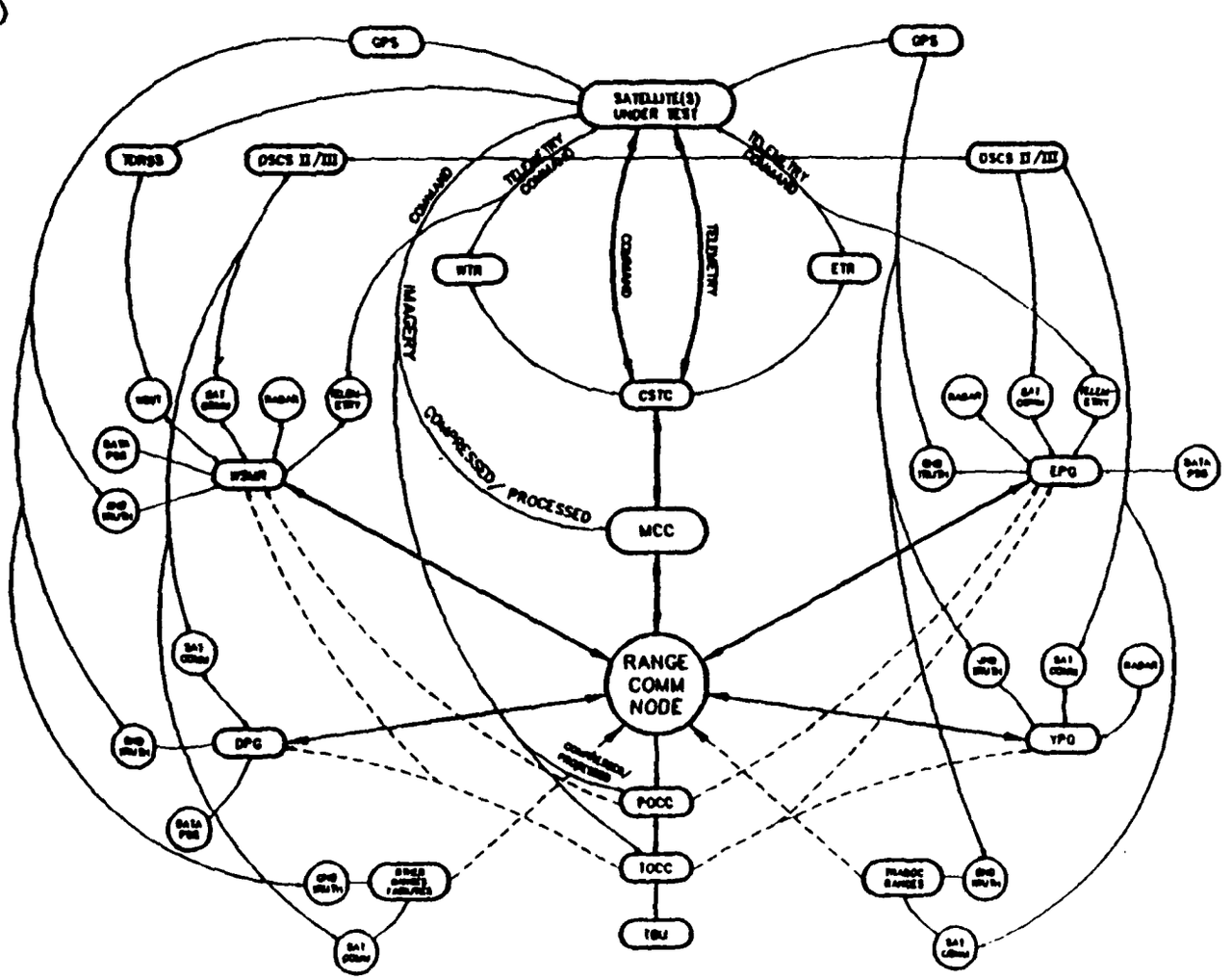
	REC *	NOTES
+ ASSTB (AR-18)	B	NONE
+ WR (NA-09)	A	PRES REQUIRE JUST
+ STR (AF-27)	A	NEED BETTER OUTYEAR JUST

* A => FUND, VERY IMPORTANT
B => FUND, DESIRABLE & JUSTIFIED

DESIGN REFERENCE MISSION SAFETY ASPECTS



INTER-RANGE COMMUNICATIONS FOR ASSTB



BOTTOM LINE

+ SPACE TESTING A REALITY
+ ONLY ONE DSTC
+ REQUIRES TRI-SERVICE SUPPORT
+ INTERNETTING KEY
+ START EFFORT NOW

AIR FORCE SYSTEMS COMMAND